I Claim:

1. A method for determining the state of stability of an electrical grid having n nodes, comprising the steps of:

a. embedding load flow equations (L) representing the electrical grid in a parametric homotopy (L(s)) that goes continuously from a 0-case (L(0)), in which all voltages are equal to the nominal voltage and there is no energy flow in links of the grid, to an objective case (L(1)) representative of the grid in the condition for which stability is to be determined;

b. developing in power series values of the load flow equations' unknowns in the parameters of the parametric homotopy (L(s)) in a neighborhood of the 0-case value of each parameter;

c. computing a continued fraction approximation to the power series coefficients produced in step b;

d. evaluating the n-order approximant of the continued fraction approximation produced in step c for the power series coefficients produced in step b to provide a solution to the load flow equations (L); and

e. displaying the solution to the load flow equations as a measure of the state of stability of the electrical grid.

2. The method of claim 1, further comprising the steps of:

prior to said embedding step, receiving data from a supervisory and data acquisition system representative of conditions of the electrical grid, and forming said load flow equations (L) from said data.

3. The method of claim 2, further comprising the steps of repeating said receiving step and steps a through e continuously to provide a continuous, real time estimation of the stability of the electrical grid.

4. The method of claim 3, further comprising the steps of confirming that a set of voltages and flows contained in said solution to said load flow equations (L) are representative of a physical electrical state.

5. A method of measuring load flow in a power generating system having an electrical grid comprised of n nodes, comprising the steps of:

a. embedding load flow equations (L) representing the electrical grid in a parametric homotopy (L(s)) that goes continuously from a 0-case (L(0)), in which all voltages are equal to the nominal voltage and there is no energy flow in links of the grid, to an objective case (L(1)) representative of the grid in the condition for which stability is to be determined;

b. developing in power series values of the load flow equations' unknowns in the parameters of the parametric homotopy (L(s)) in a neighborhood of the 0-case value of each parameter;

c. computing a continued fraction approximation to the power series coefficients produced in step b;

d. evaluating the n-order approximant of the continued fraction approximation produced in step c for the power series coefficients produced in step b to provide a solution to the load flow equations (L); and

e. displaying the solution to the load flow equations as a measure of the load flow in the power generating system.

6. The method of claim 5, further comprising the steps of:

prior to said embedding step, receiving data from a supervisory and data acquisition system representative of conditions of the electrical grid, and forming said load flow equations (L) from said data.

7. The method of claim 6, further comprising the steps of repeating said receiving step and steps a through e continuously to provide a continuous, real time measure of the load flow in the power generating system.

8. A method of measuring load flow in a power generating system having an electrical grid, comprising the steps of:

a. generating a mathematical model of a known, physical solution to the load flow equations (L) in which all voltages are equal to the nominal voltage and there is no energy flow in links of the grid;

b. using analytical continuation to develop a mathematical model of the current, physical solution to the load flow equations representing the current load flow in the power generating system; and

c. displaying the physical solution to the load flow equations as a measure of the load flow in the power generating system.

9. The method of claim 8, said generating step further comprising developing a power series expansion of all quantities in a parametric homotopy (L(s)) formed from said load flow equations (L) in a neighborhood of the 0-case value of each quantity.

10. The method of claim 9, further comprising using algebraic approximants to determine the sum of all coefficients of said power series for the load flow equations representative of the physical current load flow that is to be determined.

11. A system for measuring load flow in a power generating system having an electrical grid, said system comprising:

a supervisory control and data acquisition system adapted to collect data from said electrical grid indicative of electrical conditions in said electrical grid, said supervisory control and data acquisition system being in communication with a microprocessor-controlled energy management system, said energy management system further comprising executable computer instructions to:

a. process said data received from said supervisory control and data acquisition system into load flow equations (L) representing the electrical grid;

b. embed said load flow equations (L) in a parametric homotopy (L(s)) that goes continuously from a 0-case (L(0)), in which all voltage are equal to the nominal voltage and there is no energy flow in links of the grid, to an objective case (L(1)) representative of the grid in the condition for which stability is to be determined;

c. develop in power series values of the load flow equations' unknowns in the parameters of the parametric homotopy (L(s)) in a neighborhood of the 0-case value of each parameter;

d. compute a continued fraction approximation to the power series coefficients produced in step c;

e. evaluate the n-order approximant of the continued fraction approximation produced in step d for the power series coefficients produced in step c to provide a solution to the load flow equations (L); and

f. display the solution to the load flow equations as a measure of the state of stability of the electrical grid.